July 2014

Study of Toggle Shear For Koppers Con't Casting

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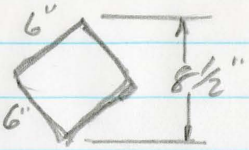
MG
17 JUNE 63

STUDY OF TOGGLE SHEAR FOR KOPPERS CONT CASTING

REF ACM MEMO 7 JUNE 63, POSSIBILITY OF A HYDRAULICALLY ACTUATED TOGGLE LINKAGE SHEAR IS INVESTIGATED:

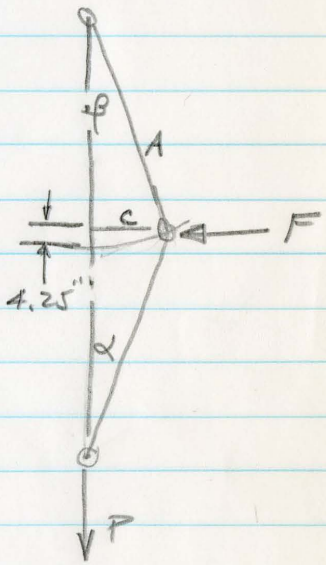
SECTION TO SHEAR:



FORCE REQ'D @ 10,000 PSI : 360,000 lb.

USING APPROXIMATE TOGGLE FORMULA AS SIMPLIFICATION:

$$P = \frac{F}{\tan\alpha + \tan\beta}$$



AND USING EQUAL-LENGTH TOGGLE ARMS AS FURTHER SIMPLIFICATION, SO THAT $\alpha = \beta$:

$$P = \frac{F}{2 \times \tan\alpha}$$

$$\tan\alpha = \frac{4.25}{C}; \quad \sin\alpha = \frac{C}{A}$$

$$\therefore \tan\alpha = \frac{4.25}{A \sin\alpha} \quad \text{OR} \quad \tan\alpha \sin\alpha = \frac{4.25}{A}$$

FOR SMALL ANGLES ($\sin \simeq \tan$): $\tan\alpha = \sqrt{\frac{4.25}{A}}$

$$\therefore P = \frac{F}{2\sqrt{\frac{4.25}{A}}}$$

ARM LENGTH A:	6"	16"	24"	30"	36"	42"	48"
REQ'D FORCE F:	607000 lb.	372000	303000	272000	248000	229000	215000 lb.

CONCLUSIONS:

WITH LONG CUTTING STROKE REQ'D, THE LENGTH OF TOGGLE ARMS REQ'D TO TAKE ADVANTAGE OF TOGGLE PRINCIPLE IS PROHIBITIVELY LONG — DIRECT ACTING CYLINDER IS LESS EXPENSIVE APPROACH.

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